

REMARKS

Claims 1-2, 4, and 9 are pending. Claims 5-8 were previously withdrawn as being drawn to a non-elected invention. Reconsideration of the application in light of the above amendments and the following remarks is respectfully requested.

I. REJECTION OF CLAIMS 1-2, 4 AND 9 UNDER 35 U.S.C. § 103(a)

Claims 1-2, 4 and 9 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Shimuzu (US 6,433,432) in view of Watanabe et al. (US 2003/0227089). Withdrawal of the rejection is respectfully requested for at least the following reasons.

A prima facie case of obviousness requires that the cited references, when combined, teach or suggest all of the claim limitations. However, the cited references fail to teach or suggest all of the claim limitations of claims 1-2, 4 and 9 for at least the below reasons. Applicants show *infra* that Shimuzu fails to require a minimum length between the trench edge and the closest via edge and that Watanebe et al. fail to cure this deficiency of Shimuzu.

Claim 1 includes forming a trench with a first edge in said low K dielectric layer over said plurality of vias wherein said trench extends a *minimum length* of 0.2 μm beyond the edge α of a via closest to the first edge of said trench, which is not taught or suggested by the cited references.

The Office Action erroneously asserts that Shimuzu teaches such a minimum length so as to participate in preventing peeling-off of plugs from metal wirings. Generally, Shimuzu discloses a semiconductor device having a fluorine insulating film and reduced fluorine at interconnection interfaces. The device prevents the problem of plugs being peeled off from an upper surface of the wiring after the protection insulating film is formed. The device of Shimuzu maintains a good connection (adhesion) between a metal film buried in a trench of a fluorine containing insulating film and

another metal film connected to such metal film. (Column 2, lines 19-24). Shimuzu attempts to reduce the amount of fluorine on the surface of the metal film buried in the trench so as to improve the adhesiveness between the metal film and the metal plugs or the metal film and the overlying fluorine-noncontaining insulating film. (Column 2, lines 43-50)

Shimuzu employs a sputter to etch the surface of the copper wiring 10 via the holes 12a to remove an oxide film formed on the surface of the copper wiring 10. (Column 5, lines 45 to 48). As a result of the sputter, shoulder portions of the second SiOF film 12 around the holes 12a are obliquely scraped off. (Column 5, lines 49-52). ***The scraping of the shoulder portions is merely a result of the sputter and does not establish a minimum length from the trench edge and the via edge as required in claim 1.*** The Office Action is apparently assuming that a shoulder portion between the closest hole and edge of the pad trench 12b is required thereby establishing a minimum distance. However, this is not the case. For example, if an edge of the pad trench 12b and an edge of the closest hole were in line with no distance or length between, there would simply be no shoulder portion to be scraped. Shimuzu does not preclude this event nor require a shoulder portion to be present between the closest hole and the edge of the pad trench 12b. As stated above, Shimuzu scrapes the shoulders only as a result of removing the oxide film from the surface of the copper wiring. As a result, Shimuzu does not require or teach a minimum distance, such as the minimum length of 0.2 μm , between an edge of the pad trench and an edge of the closest hole as claimed.

It is noted that the Office Action suggests that the scraping off of the shoulders participates in preventing the peeling off of the plugs from the metal wirings. Applicants respectfully disagree. As shown above, Shimuzu relies on adhesion between the copper wiring and the overlying plugs and film in order to prevent peeling. The sputter is performed to remove fluorine from the surface of the copper wiring 10 and the shoulder formation is merely an unintended by-product thereof. (Column 8, lines 43-53,

and, for example Figs. 5, 6, 12, and 13). Therefore Shimuzu fails to teach or suggest the above highlighted feature.

Watanabe et al. fail to cure the *deficiencies* of Shimuzu.

The Office Action suggests that Watanabe et al. teach a minimum length, however, it does not. Watanabe et al. merely provide dimension examples of various wiring patterns and width patterns (Paragraph 175) and does not teach or suggest a minimum length between a via edge and a trench edge.

Claims 2 and 4 depend from claim 1 and are not taught by Shimuzu and Watanabe et al., alone or in combination, for the above reasons. Additionally, claim 9 includes a minimum length as in claim 1 and is also not taught by Shimuzu and Watanabe et al., alone or in combination, for the above reasons. Accordingly, withdrawal of this rejection is respectfully requested.

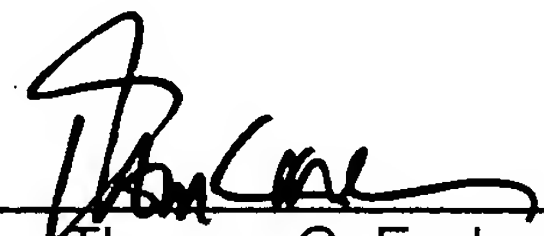
II. CONCLUSION

For at least the above reasons, the claims currently under consideration are believed to be in condition for allowance.

Should the Examiner feel that a telephone interview would be helpful to facilitate favorable prosecution of the above-identified application, the Examiner is invited to contact the undersigned at the telephone number provided below.

Should any fees be due as a result of the filing of this response, the Commissioner is hereby authorized to charge the Deposit Account Number 20-0668, TI-36211.

Respectfully submitted,
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CERTIFICATE OF MAILING (37 CFR 1.8a)

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Mail Stop AF, Assistant Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Date: November 8, 2005


Christine Gillroy